

REMARKS/ARGUMENTS

Claims 17, 19-29, and 31-39 are pending in the Application. Product-by-process Claims 18 and 30 are now cancelled without prejudice or disclaimer. Claims 17, 26, 29, 34, and 39 are currently amended.

The amendments to Claims 26, 34, and 39 are editorial in nature and respond to the Examiner's Objection to Claim 34 (Office Action dated May 27, 2010 (OA), page 2) and rejections of Claims 26 and 39 under 35 U.S.C. § 112, 2nd ¶ (OA, p. 3, last two ¶¶).

Claims 17 and 29 are currently amended to include the art-accepted units for solubility parameters ($\delta_1 \text{ MPa}^{1/2}$) and ($\delta_2 \text{ MPa}^{1/2}$) after 1984. Support therefore is found in the Specification at page 11, line 14, to page 12, line 12. There, the solubility parameter (δ) is twice referenced "according to Hildebrand" (Spec., p. 11, ll. 21-24). At page 12, lines 1-4, the Specification instructs:

Information on the solubility parameter can be found in "CRC Handbook of Polymer-Liquid Interaction Parameters and Solubility Parameters" - Allan F.M. Barton - CRC Press, Boca Raton, Boston.

The referenced "CRC Handbook" sets the conventional standard in the art relative to the Hildebrand Solubility Parameter, was first published in 1990 with the same title, author, publisher, and place of publication identified at page 12, lines 1-4, of Applicant's Specification, is catalogued in Library of Congress Card No. 89-1590 with the call number QD381.9.S65B37 1990, and is readily available to any person having ordinary skill in the art upon request.

The cited CRC Handbook generally identifies solubility parameter (δ) as the Hildebrand Solubility Parameter, with or without specified units, i.e., the units $\text{MPa}^{1/2}$ would be understood by a persons having ordinary skill in the art on or after the 1990 publication date of the Handbook whether or not expressly identified. As evidence thereof, Burke, ("Solubility Parameters: Theory and Application," pages 1-6, 1984), cited by the Examiner in

the May 27, 2010, Office Action, states under Part 2 - The Hildebrand Solubility Parameter, Units of Measurement, "Values are shown in both the common form which is derived from cohesive energy densities in calories/cc, and a newer form which, conforming to standard international units (SI units), is derived from cohesive pressures . . . expressed in megapascals [MPa^{1/2}]" (Burke, p. 2). Most significantly, Burke states, "Literature published prior to 1984 should contain only the common form" After 1984, Burke, Barton and persons having ordinary skill in the art would have been expected to employ the newer SI units MPa^{1/2}. The Handbook cited for information on the Hildebrand solubility parameters (δ) employed throughout Applicant's Specification was published in 1990. This Application was filed November 17, 2006. Thus, persons skilled in the art would have understood at the time this Application was filed that the Hildebrand solubility parameter (δ) employed throughout Applicant's Specification and in currently amended Claims 17 and 29 have the newer SI units MPa^{1/2}.

No new matter is added.

Objections to the Specification

The Examiner objects to the lack of Hildebrand solubility parameter units in the Specification and the fact that the standard reference "CRC Handbook of Polymer-Liquid Interaction Parameters and Solubility Parameters" - Allan F.M. Barton - CRC Press, Boca Raton, Boston (1990), has not been made of record. The Specification instructs at page 12, lines 1-4:

Information on the solubility parameter can be found in "CRC Handbook of Polymer-Liquid Interaction Parameters and Solubility Parameters" - Allan F.M. Barton - CRC Press, Boca Raton, Boston.

The reference was first published in 1990 with the same title, author, publisher, and place of publication and is catalogued in Library of Congress Card No. 89-1590 with the call number QD381.9.S65B37 1990. It is readily available to any person having ordinary skill in the art

and the Examiner by inter library loan upon request. However, if the Examiner insists, Applicant will on specific request obtain a copy of the cited document and make it a permanent part of the record.

As stated, the CRC Handbook generally identifies solubility parameter (δ) as the Hildebrand Solubility Parameter, with or without specified units. The units $\text{MPa}^{1/2}$ would be understood on and after the 1990 publication date of the CRC Handbook whether or not expressly identified in the Specification. In fact, Burke (1984), cited by the Examiner, states under Part 2 - The Hildebrand Solubility Parameter, Units of Measurement, "Values are shown in both the common form which is derived from cohesive energy densities in calories/cc, and a newer form which, conforming to standard international units (SI units), is derived from cohesive pressures . . . expressed in mega-pascals [$\text{MPa}^{1/2}$]" . Burke also states, "Literature published prior to 1984 should contain only the common form" After 1984, Burke, Barton and persons having ordinary skill in the art invariably refer to the newer SI units $\text{MPa}^{1/2}$. The CRC Handbook cited for information on the Hildebrand solubility parameter (δ) employed throughout Applicant's Specification was published in 1990. Thus, persons skilled in the art would have understood at the time this Application was filed that the Hildebrand solubility parameter (δ) employed throughout Applicant's Specification and in currently amended Claims 17 and 29 have the newer SI units $\text{MPa}^{1/2}$.

Persons skilled in the art reasonably would have understood from Applicant's Specification the all references to Hildebrand solubility parameter (δ) therein have the newer SI units $\text{MPa}^{1/2}$. Should the Examiner require, express identification of the newer SI units $\text{MPa}^{1/2}$ for the Hildebrand solubility parameter (δ) can be added to the Specification.

Thus, the Examiner's objections should be withdrawn.

Objection to Claim 34

In light of the current amendment to Claim 34, the objection thereto (OA, p. 2) should be moot.

Rejections of Claims 17-39 under 35 U.S.C. § 112, 2nd ¶

In light of the current amendments to Claims 17, 29, 26, and 39, all prior rejections under 35 U.S.C. § 112, 2nd ¶ (OA, p. 3), should now be moot.

Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1385 (Fed. Cir. 1986), teaches that claims need only “reasonably apprise those skilled in the art” of their scope and be “as precise as the subject matter permits.” In this case, after referring persons having ordinary skill in the art to the “CRC Handbook of Polymer-Liquid Interaction Parameters and Solubility Parameters” - Allan F.M. Barton - CRC Press, Boca Raton, Boston (1990), for information relating to the Hildebrand solubility parameter (δ) utilized throughout the Specification and claims, persons skilled in the art reasonably would have been apprised and understood that all Hildebrand solubility parameters (δ) referred to in the Specification and previously presented Claims 17 and 29 have the newer SI units MPa^{1/2}. Nevertheless, the rejection should now be moot because MPa^{1/2} have been added to currently amended Claims 17 and 29.

Accordingly, all rejections of Applicant’s claims under 35 U.S.C. § 112, 2nd ¶, should now be withdrawn. No new matter is added in light of the original description of the invention in the Specification.

Rejections of claims under 35 U.S.C. § 103

Claims 17-19, 23-25, and 27-28 were rejected under 35 U.S.C. § 103 over Demirors (U.S. Patent 6,545,090, issued April 8, 2003) in view of Echte (U.S. Patent 4,493,922, issued January 15, 1985), and the table from “CRC Handbook of Solubility Parameters and Other Cohesion Parameters,” Barton (2nd Edition, 1991, page 406).

Claims 20-22 and 26 were rejected under 35 U.S.C. § 103 over Demirors in view of Echte, "CRC Handbook of Solubility Parameters and Other Cohesion Parameters," Barton (2nd Edition, 1991, page 406), further in view of Monti (U.S. Patent 5,942,575, issued August 1989).

Claims 29-31, 35-37, and 39 were rejected under 35 U.S.C. § 103 over Demirors in view of Echte, "CRC Handbook of Solubility Parameters and Other Cohesion Parameters," Barton (2nd Edition, 1991, page 406), further in view of Henton (U.S. Patent 4,785,051, issued November 1988).

Claims 32-34 and 38 were rejected under 35 U.S.C. § 103 over Demirors in view of Echte, "CRC Handbook of Solubility Parameters and Other Cohesion Parameters," Barton (2nd Edition, 1991, page 406), further in view of Henton and Monti.

First, the Examiner should immediately note that product-by-process Claims 18 and 30 are now cancelled. Accordingly, all claims now pending in the Application are directed to mass-continuous processes for the preparation of a rubber-reinforced vinyl aromatic (co)polymer, not the rubber-reinforced vinyl aromatic (co)polymers produced by the process itself. Therefore, the Examiner's findings and conclusions that it would have been obvious to persons having ordinary skill in the art to optimize the prior art processes disclosed by Demirors and Echte to improve the bimodal morphology of the products produced by their respective processes is immaterial to the patentability of the processes Applicant currently claims if no combination of the teachings of Demirors and Echte, even with Barton's CRC Handbook, Monti, and/or Henton reasonably would have suggested the steps and elements of the specific processes Applicant claims.

The problems with the Examiner's conclusions of obviousness in this case are that the Examiner must rely on findings of inherency, immaterial calculations, and general incentives to optimize bimodal morphology to establish that the prior art reasonably suggests the

claimed processes. The reason the Examiner must do so is that the prior art nowhere teaches or reasonably suggests all the steps and elements of Applicant's claimed processes.

Echte discloses rubber-reinforced vinyl aromatic (co)polymers desirably having bimodal morphology. Assuming an art-recognized preference for improving bimodal morphology, it would have been within the ordinary skill of the artisan to optimize the result effective variables in Echte production process to achieve a better result. However, Echte's preferred process involves production of a polystyrene matrix containing rubbers with different morphology by mixing two polystyrene polymers, each containing a different elastomeric polymer or rubber, in the molten state (Echte, col. 2, ll. 48-53; col. 3, Example 1).

As a non-preferred process, Echte teaches (Echte, col. 2, ll. 53-62; emphasis added):

Mixing of such materials can also be carried out in solution, with subsequent devolatilization. Equally, it is possible to prepare two different graft polymers by a continuous process, the prepolymerization, with adjustment of particles size and morphology of the particles, being carried out separately and the two prepolymers then being combined in a certain ratio, after which the polymerization is carried out conjointly up to the desired high solids content

Echte's Example 3 reflects the non-preferred processes.

However, Echte does not disclose or reasonably suggest first preparing a solution comprising (1) from 3 to 20% by weight of a rubber having a solubility parameter (δ_1 MPa^{1/2}), selected from the group consisting of homopolymers and copolymers of 1,3-alkadienes containing 40-100% by weight of 1,3-alkadiene monomer and 0-60% by weight of one or more mono-ethylenically unsaturated monomers, and (2) from 0.05 to 8.0% by weight of a rubber having a solubility parameter (δ_2 MPa^{1/2}) selected from the group consisting of homopolymers and copolymers of olefins or 1,3-alkadienes, and (3) at least one vinyl aromatic monomer, and then polymerizing the solution at a temperature ranging from 50 to 250°C, using rubbers (1) and (2) wherein the rubber of solubility parameter δ_1 and the rubber of solubility parameter δ_2 are incompatible, $\delta_1 - \delta_2 \geq 0.5$, to obtain rubber-reinforced vinyl aromatic (co)polymer with a strictly bimodal morphology. No incentive to optimize the

result effective variables in the processes Echte teaches could possibly remedy Echte's failure to teach or reasonably suggest the process Applicant claims. Echte does not select two incompatible rubber based on solution parameters and the relationship $\delta_1 - \delta_2 \geq 0.5$ and does not dissolve the two rubbers in at least one vinyl aromatic monomer before polymerizing or pre-polymerizing the two rubber-containing vinyl aromatic monomer solution as Applicant's claims require.

Therefore, the Examiner must rely primarily on Demirors' disclosure to make a case for the obviousness of the processes Applicant claims. Again, Applicant's claims are directed to processes only. Whether or not the same or similar rubber-reinforced vinyl aromatic (co)polymers having strictly bimodal morphology might or can be produced by either or both of Demirors' and Echte's processes, or an optimized process they together suggest, is irrelevant to the patentability of the processes Applicant claims. The facts are that Demirors does not teach or reasonably suggest (a) selecting rubbers (1) and (2) wherein the rubber of solubility parameter δ_1 and the rubber of solubility parameter δ_2 are incompatible, $\delta_1 - \delta_2 \geq 0.5$, (b) preparing a solution comprising (1) from 3 to 20% by weight of a rubber having a solubility parameter ($\delta_1 \text{ MPa}^{1/2}$), selected from the group consisting of homopolymers and copolymers of 1,3-alkadienes containing 40-100% by weight of 1,3-alkadiene monomer and 0-60% by weight of one or more mono-ethylenically unsaturated monomers, and (2) from 0.05 to 8.0% by weight of a rubber having a solubility parameter ($\delta_2 \text{ MPa}^{1/2}$) selected from the group consisting of homopolymers and copolymers of olefins or 1,3-alkadienes, and (3) at least one vinyl aromatic monomer, and then (c) polymerizing the solution at a temperature ranging from 50 to 250°C, using the rubbers (1) and (2) wherein the rubber of solubility parameter δ_1 and the rubber of solubility parameter δ_2 are incompatible, $\delta_1 - \delta_2 \geq 0.5$, to obtain rubber-reinforced vinyl aromatic (co)polymer with a strictly bimodal morphology.

Demirors teaches a process for preparing rubber-reinforced vinyl aromatic (co)polymers having bimodal morphology by dissolving two elastomers having extremely different molecular weights in a vinyl aromatic monomer and polymerizing the composition (Demirors, col. 2, l. 56, to col. 3, l. 6). Demirors selects the different elastomers or rubbers based on their distinct molecular weights. Demirors does not teach or reasonably suggest that the two elastomers dissolved in the vinyl aromatic monomer should or may be selected based on Hildebrand solubility parameters without concern for their molecular weights. Demirors process is characterized by selecting diene rubbers for dissolution in the reaction mixture based on "distinct high and low molecular weight" (Demirors, col. 2, l. 66, to col. 3, l. 1). "[T]he high molecular weight component . . . [has] a weight average molecular weight at least two and one half times greater than the weight average molecular weight of the low molecular weight component, both components having a 1,4 cis configuration of greater than 70 percent" (Demirors, col. 3, ll. 1-6; emphasis added). The process Applicant claims is not concerned with large molecular weight differences between its two rubbers or the percentage of 1,4 cis configuration in the different rubbers. Applicants process uniquely focuses on the respective Hildebrand solubility parameters of the two rubbers. Demirors teaches nothing of the kind.

Recognizing the blatant deficiencies in the teachings of Demirors and Echte, the Examiner relies on unusually-derived calculations based on certain specific components and contrived proportions and spurious inherency arguments. For example, based on Table 1 of another CRC Handbook, the Examiner first finds that polybutylene generally has solubility parameter (δ) of 17.0 and polystyrene generally has a solubility parameter (δ) of 18.5. The Examiner so finds irrespective of the molecular weights of the polymers. Then, the Examiner surmises that 95:5 and 5:95 ratios of styrene-butadiene copolymers would naturally have a calculated $\delta_1 - \delta_2 \geq 0.5$, regardless of their molecular weights. Applicant recognizes no prior

art support for the Examiner's calculations or results. However, even assuming the Examiner's calculations are correct, the monomers and ratios thereof which form the rubbers upon which the Examiner's calculations are based are not shown to be reasonably related to the two distinct kinds of rubbers used to prepare the solutions prepared by Applicant's claimed processes or the two distinct kinds of rubbers used to prepare the solutions prepared by the process Demirors discloses.

Moreover, Demirors expressly requires very specific ratios for the weight average molecular weights of its choice rubbers and an extremely high 1,4 cis content for both of its two rubbers. Thus, Demirors' teaching would have led persons having ordinary skill in the art to believe that two rubbers which do not have the specific ratios for the weight average molecular weights and 1,4 cis content required of its two rubbers would not achieve strictly bimodal morphology regardless of their relative solubilities.

Nevertheless, the Examiner appears to find that Demirors' two distinct rubbers would inherently be incompatible, $\delta_1 - \delta_2 \geq 0.5$, regardless of their molecular weights and their 1,4 cis content. There is no basis whatsoever in the prior art or Applicant's Specification for that finding. In fact, contrary to Applicant's teaching and the Examiner's calculations, Demirors appears to suggest that high molecular weight and low molecular weight rubbers with a 1,4 cis content of 70% or more which are made from the same comonomer mixture should effectively produce bimodal morphology regardless of their respective solubility parameters.

Moreover, Demirors does not suggest the relative proportions required by Applicant's claims or the ratios of the high molecular weight rubber to low molecular weight rubber. Demirors' variable is molecular weight. Applicant's variable is solubility parameter. There is no reasonable certainty that there is any overlap between the processes Applicant claims and the processes Demirors discloses. Accordingly, the Examiner's conclusion that Demirors

and Echte reasonably suggest a process which the Examiner finds inherently satisfies all the limitations of Applicant's claimed process has no basis in fact or law.

In re Oelrich, 666 F.2d 578, 581 (CCPA 1981), teaches that the mere fact that a certain thing may result from a given set of circumstances is not sufficient to prove inherency. Inherency may not be established by probabilities or possibilities. Something that is inherent must inevitably be the result each and every time. The fact that a certain result or characteristic may occur or may be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999)(citations omitted). An invitation to experiment is not an inherent disclosure. *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1367 (Fed. Cir. 2004).

Finally, *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990), instructs:

In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. In this case, the Examiner has not provided a basis in fact and/or technical reasoning to support a finding that the allegedly inherent characteristics of Applicant's claimed process necessarily flow from Demirors' teaching. Therefore, the Examiner's rejection of Applicant's claims based on the Examiner's finding of inherency cannot stand and should be withdrawn.

Again, whether or not the rubber-reinforces vinyl aromatic (co)polymers made by Applicant's claimed processes are suggested, or could be made, by the prior processes disclosed or reasonably suggested by Demirors and Echte is not at issue. The fact is that Demirors and Echte, optionally combined with the teachings of the CRC Handbook, Monti, and/or Henton do NOT reasonably suggest the processes Applicant claims with any reasonable expectation of successfully making and using a rubber-reinforced vinyl aromatic (co)polymer having strictly bimodal morphology. The law requires no less. *In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988).

While *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), recognized that "obvious-to-try" criteria may form the basis for a conclusion of obviousness where the options are limited, *KSR* also taught that a conclusion of obviousness without a suggestion, teaching, motivation, or incentive to do what an applicant is most likely to be erroneous.

For the reasons stated herein, Applicant's claims are patentable over the applied prior art and otherwise in condition for allowance. Accordingly, early Notice of Allowance is respectfully requested.

Respectfully submitted,

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